

Eng. Hist. Soc. 1844
OBSERVATIONS

O N.

BRIDGE BUILDING,

And the several PLANS offered for a

NEW BRIDGE.

In a LETTER addressed to the Gentlemen of the Committee, appointed by the Common-Council of the City of London, for putting in Execution, a Scheme of building a new Bridge across the Thames, at or near Black Friars.

Homines enim ad Deos nulla re propius accedunt, quam salutem hominibus dando ; nihil nec fortuna tua majus, quam ut possis ; nec natura melius, quam ut velis conservare quamplurimos. Longiorem orationem causa forsitam postulat, tua certe natura brevior. Cic.

----- much more, in this great Work,

----- should we survey

The Plot of Situation, and the Model ;
Consent upon a sure Foundation,
Question Surveyors, know our own Estate,
How able such a Work to undergo,
To weigh against his opposite ? Or else,
We fortifie in Paper and in Figures,
Using the Names of Men instead of Men :
Like one that draws the Model of a House
Beyond his Pow'r to build it ; who, half through,
Gives o'er, and leaves his part-created Cost
A naked Subject to the weeping Clouds.
And waste, for churlish Winter's Tyranny.

SHAK.

L O N D O N :

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M.DCC.LX.



A

LETTER

TO THE

Gentlemen of the Committee, appointed by the Common Council of the City of London, for putting in Execution, a Scheme of building a new Bridge across the Thames, at or near Black-Friars.

GENTLEMEN,

AM very sensible how absurd it
I would be for any individual to
give his opinion, so as to appear
to direct the judgment of so able and worthy a body of men, in the common affairs

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fairs

fairs of the city. But the present business, which is to distinguish in an art of an abstracted, difficult, and unusual nature, being such as probably will not offer again for ages to come, I beg leave to suggest a few thoughts; which, if they should be of the least service, will more than reward this intention of collecting so far as I have been able, and laying before you, the different opinions of those who have had an opportunity to see all the plans given in.

After having overcome all the difficulties which attend the beginning of such a public work, where the different interests of so many individuals are concerned, you are at last arrived at that crisis, wherein by your determination, you are to do honour to yourselves, to this age, and to your country for a long series of years, by erecting a strong, useful, and magnificent bridge; or to forfeit your own reputations, bring a reflexion upon your age and country, and render yourselves justly contemptible in the eyes of posterity for many generations to come, by leaving them a weak, inconvenient or mean one.

Out

Out of a great number of plans that have been presented, there are 11 which you have ordered to lie on the table, with an intention to pick out from among these that one which deserves to be put in execution. Give me leave therefore to offer the following remarks, as an individual of this city, and one who wishes well to his country and to posterity; which I hope will be apology sufficient to men of your candor and integrity for the trouble of this address.

The number of the plans in competition, as I have observed, are 11; and the number of their authors eight, gentlemen who have sufficiently distinguished themselves in some part or other in the art of building, so as to make us hope, that this bridge will be built in such a manner, as to afford an easy and safe passage across the river for ages to come, and convey a just idea to our posterity of the wealth and opulence of this city; and withal shew them how sensibly Englishmen have always thought and acted, in things where the publick is concerned.

For the sake of order, I shall consider them alphabetically. Their names are,

Messrs.	{	Bernard,
		Chambers,
		Dance,
		Gwyn,
		Mylne,
		Phillips,
		Smeaton,
		Ware.

Before I say any thing of what has been offered by these ingenious gentlemen, it is necessary to investigate what it is that is wanted: For when a rule or standard is made, I may then apply each of their schemes to see how it deviates, more or less, on one side or the other. And you, who have but short time for the consideration of this point, may the better judge with perspicuity and precision, when the evidence is summed up.

It is required to build a bridge across the Thames from Black-Friars to the opposite shore. By that is meant the easiest passage for men and carriages along such a bridge, and the same convenience for such craft as navigate the Thames, under it. The best passage for the first
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would be a straight line from the top of one bank to the top of the other, and the best for the second would be, that this line should be elevated so high as not to give any trouble in passing under it. The best bridge for utility therefore will be that which strikes a just medium between these two extraordinary opposites.

When an easterly wind blows, and a spring tide is at its greatest height, with freshes from the land; then the surface of the river Thames, is on a level with its banks at Black-Friars. At that point of time, men and carriages are to pass along the bridge, and craft are to pass under it.

To allow boats to pass, under the surface of the end of the bridge, upon that level, it would be necessary to lay as much earth on the present banks, as to raise the surface of the bridge to that height. Any more would be unnecessary. And to allow barges and larger craft to pass likewise, a height proper for them may be gained in the middle of the river, where they commonly go, by a gentle rise, not too steep for the carriages upon the bridge, from that supposed height on the shore. The height of the arch next the land in
Westmin-

Westminster bridge, is 15 feet from the highest water-mark, which from the observation of what passes under it, I find is rather more than necessary. The height of the forced earth is about 15 feet also, and there is a very steep and inconvenient rise from that to get on the top of the arch. So that the end of the bridge might have been as convenient for the passage of boats under it, if it had been three or four feet lower, and much more convenient for carriages, to go along it. From this I should imagine, that any number of feet from 12 to 15 was sufficient for the passage of boats under the end of the bridge; and to get upon that height with ease, any number from 13 to 17 would be enough of forced earth to be laid upon the present banks of the Thames. From what the masters of barges and watermen say, I find that the distance of 26 feet from the highest water-mark, to the crown of the great arch in Westminster bridge, is not altogether sufficient for the passage of large craft. This number of feet might have been very easily increased; because the rise from the end of the bridge to the middle is so gentle, that it would have allowed of it, and a pro-

Land Arch
high water

Earth

proper height might have been obtained for their easy passage. So that any number of feet from 26 to 31, would be nearly about the perfect height for that conveniency of the space from high water to the crown of the great arch.

Having fixed this imaginary line, as what I humbly think a just medium between going along such a bridge, and navigating on the river under it; the next requisite is to support it. And to do it in such a manner, that the piers and arches, which are placed there for that purpose, shall as little as possible obstruct the flux and reflux of the river, and boats and barges moving on it. This end alone would be best answered by having none at all, or if any the most slender ones; but strength and duration must be also consulted; so that the just medium will be the sufficient strength, so as to make it last for ages, placed in that manner which is most agreeable to this conveniency.

This I shall make one of the considerations in going over the plans; and endeavour, as well as my judgment will allow, to set it and every other particular in as clear a light as possible. It is a more complicated

plicated subject than most people are aware of, and if I should fail in any particulars, I make no doubt for the good of this community, you will add what may be found good, to that suggested by your own superior judgments, or what may be collected for your use by some more able hand.

I must beg pardon of the gentlemen, who are authors of these plans, and hope that they will consider what may be said against their inventions, is not against them, but the sole intention of serving the public, in procuring our and our posterity's happiness in this particular.

Mr. BERNARD.

This gentleman is a carpenter, and has produced many ingenious inventions in that art. But I doubt whether he has succeeded as well in this first production of a composition in stone work. It is the fate of architecture, that there are such precise rules for conveying ideas in this art, that any one may copy and produce pieces of it at pleasure, at the same time that they have not had an opportunity by study and education, to know when these parts are most ap-

applicable to particular cases. This I apprehend is the real state of the manner, by which Mr. Bernard has composed his plan. For although the ornaments upon the side of his bridge, have been used and are used by architects, yet it is utility that gives the sanction. He does not seem to have known the shortest way to support recesses from the ends of the piers, and for that reason has crowded niches, pediments, plinths, pedestals, cornices, on one another in that space; which are all good in themselves, but applied here in that tower-like manner are very improper. All this workmanship is expended to support a recess, which in the form of a bathing tub, does not afford space enough, to make use of it in that capacity. The middle arch is a semicircle of 100 feet wide, and springs from three feet below low water mark; therefore is 31 feet from high water mark. This is a very good width and height for water way and large craft, and the piers are strong enough and yet not too thick to support it. The height from high water to the top of the arch, next the shore, is too much for what is required of it; so that the quantity of forced earth, is such, that

it would make a vast addition to the expence of the bridge, and come up to the level of the second floor of the houses, which may be built along side of it. Abstracted from this particular, the proportion of the arches and piers are well enough, but the improper and mean manner in which he has ornamented it, would be sufficient reason with people less knowing than you are, to reject his plan. From his not attending the last committee, we have no particulars about his method of construction, and therefore can say nothing of it.

Mr. CHAMBERS.

This plan has a grand, a lofty, and a magnificent appearance at first sight. How far it is applicable to the present case, we shall now consider. This gentleman has studied regularly the art of architecture, and neglected no opportunity of making himself a compleat artist. What foundation of genius he had to go upon, I cannot say; but it appears from this composition of a bridge, that he has studied implicitly, those noble remains the Romans have left behind, without enquiring into their laws, customs,

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or nature of climate, to know their reasons
 for doing and thinking as they did. Lon-
 ginus says of this sort of genius, compar-
 ing it to the inspiration of the Pythian
 priestesses, " That, from the sublime spirit
 " of the ancients, there arises some fine
 " effluvia, like vapours from the sacred
 " vent, which work themselves insensibly
 " into the breasts of imitators, and fill those
 " who are not naturally of a towering ge-
 " nius, with the lofty ideas and fire of o-
 " thers." Mr. Chambers has introduced
 every idea that could arise from viewing the
 vestiges of ancient Rome; but I am sorry
 to say, it is not with the same propriety as
 when the thing was done by the Romans.
They thought of what they wanted, be-
fore they invented; and for that reason pro-
duced every thing with the most rigid pro-
priety; at the same time that they were
 fired with the magnificence of the Roman
 empire. His thought of making this bridge
 a triumphant one is glorious, and well be-
 coming at present the dignity of the Eng-
 lish nation: But the manner in which he
 does it, is rather imitative. He should have
 considered that the customs of the English
 are very different from the Romans, and

that although they invented the very proper form of an urn, as a repository for the burnt ashes of the dead; yet why should an English hero, who has fallen and been stretched out cold in his country's service, be crammed neck and heels into the same form; for no other reason but that 2000 years ago a people superior to every other nation made use of it. This explanation of the urn will serve through most of the other parts of this composition. He has placed them all along the sides of the bridge, in niches above the ends of the piers; and some of them, of superior merit I suppose, have a pair of semicolumns, with a frontispiece which pretends to screen them from the weather, and yet cannot have that effect. The triumphal arch, a beautiful piece of architecture, which stands upon the middle arch, he has left out in his second proposal to you, the committee. And well he might, for although it would have added grandeur and elevation to the bridge, yet its uselessness in its self, and its blocking up the coach way to about 23 feet, would be sufficient reasons for taking it away; if it was not, as it really is, excluded by the act of parliament.---The fine shaped smoaking
urns

urns on the top of the bridge, would raise noble ideas in the minds of a Cato or a Brutus, when standing on the ashes of some eminent dead in the Appian Way; but what would their ideas be, what would an Englishman think, when told that they contain a living watchman or toll-gatherer, who sits there hovering over a cinder fire. Mr. Chambers's proposal of making all the piers and filling up the spandrells betwixt the arches with brick, is mean, and not at all of a piece with his own ideas when he sat down to invent it. The balustrade is elegant, but the cornice is trifling. Modillions, Vitruvius says, imitate the ends of rafters, and every part of a cornice is taken from these materials which compose a roof. What has a roof to do on a bridge, or allowing that absurdity, what occasion is there that men should be the dupes of their own misled imagination so far, as to pick at a large stone, till it becomes a dwarf, and imitates several pieces of wood. The stairs are too narrow, and besides the inconvenience of affording their entrance ready, for any drunken person, who intends to go along the bridge, they contain a space betwixt them and the bridge, which will very
pro-

probably preserve a continual smell for those who go down to take water.----The width of the three middle arches is 70 feet each, and spring from low water mark. The curve is a semicircle. This width, I should imagine, might be larger, and therefore more convenient for the passage of barges through it, without being inconvenient in any other particular. The height of this arch is but 19 feet from high water mark, so that according to our smallest number as a standard, it is seven feet too low; but when one considers this small height, along with the narrowness of the arch, it must be concluded, that it would be entirely inconvenient for navigation; besides the disagreeable idea that it would give, of an approaching deluge, or its sinking through the bottom of the river. ----The thickness of the piers is 20 feet, strong enough without doubt to support this arch, and the triumphal one on the top of it. But since he removed the triumphal arch, there is no occasion for all this thickness of pier, which he thought then sufficient for the support of both. The two next piers to them, instead of being smaller, become larger; and for no reason that I can find out,

out, for according to the original invention they bear less weight than the two middle ones. The two next to them again all of a sudden jump down to about 10 feet. This proportion of piers to arches is, I own, beyond my comprehension; but allowing the middle ones to be right, which by the by are too large by far in a navigable river, all the rest are wrong, since they are not in the same proportion.

The ends of the piers, which cut the water, are of a very extraordinary form; the angle which projects forward for that purpose, does not cover all the end of the pier, but leaves a space at each corner, where the stream may run full against it, and play in eddies round the corners. The foundation of the bridge, if it was in a rapid river, would be endangered by this, but even in the Thames it cannot be of any service. Upon the whole, I should imagine, that the proportions of this design, is only applicable to a river, where the tide rises 9 or 10 feet; and even in that case, it is necessary it should be altered in many particulars, which regard conveniency: And as to the ornaments, I have given my opinion, but leave it to the decision of others,

Mr.

Mr. DANCE.

This gentleman is growing old in the city's service, and has had a continued opportunity of learning a great deal from experience. The design which he has given in, is however no proof of his having made any accurate observation or calculation in this art; but seems rather to be of a piece with the times wherein he received his education. Although the drawing part of it, is neither neat nor masterly, yet I am informed it was done by a young lad whom he thought superior in that respect. He has made the arches at the ends of the bridge so high, that he has been obliged to suppose that the banks should be raised 27 feet. This would not only be a monstrous additional expence to his already supposed price of the bridge, but be so inconvenient, that it would be madness to put it into execution. For it can only be supposed that the breadth of one street to the end of the bridge is made so high, and then it would be on a level with the windows of the second floor of these houses built next the river. But what becomes of all the ground round about, on the right and left of that supposed aerial street? Must the
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the streets and houses there have no communication with the bridge ; for in that case supposing a carriage to be at the river side, near the end of the bridge, it must go all the way to nearly the end of Fleet-Market, before it can get on the entrance to the bridge. This quantity of forced earth, therefore would not only render it very expensive, but even supposing that it should be done, it still would be the most inconvenient entrance to a bridge, that could possibly be contrived ; especially as it does not give any great additional convenience in another respect. The proportion of the piers and arches are all very well, and such as would afford a very good water way and space for barges. The height of the great arch is 31 feet from high water, and is sufficient for all the large craft ; but the height of the arches next the land is preposterously too much, and causes the great inconvenience above-mentioned. This might have been avoided, I should think, by making the arches next the land, lower ; and that would not have made the rise from them to the middle too much, for the ordinary pull of carriages. The ornaments of the niches, and placing such niches in the

spandrels of the piers is very trifling, and makes these whole spaces look bare like a plaistered wall; nor can I find the reason of putting them there at all, if it was not, that it was found necessary to dig a hole in the side of the spandrels, to take away in some degree, the great bareness already there. The cornice along the bridge is very trifling too, and is still worse than that of Mr. Chambers; to which I refer you, for my sentiment upon this head. The manner in which he proposes to lay the foundation of the piers, he says, is no *chimera*; because it is an invention of Vitruvius. It is a lamentable case that all the inventions of great men come under a disrepute, by being made use of by people less knowing. Vitruvius recommends in building a mole, to make an inclosure all round, and pump the water out, so as to make it dry; and this only in such places of the Mediterranean sea, where no Puozzollo earth could be found. Mr. Dance might have observed, that Vitruvius recommends this in a sea, where there is no rise and fall of tides. Here in the river Thames there is one of 16 feet, so that there would be an immense weight of water upon the outside of this
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inclosure. The difference from high water to low water is 16 feet; the depth from low water to the surface of the filth, is about eight feet at most; the thickness of the filth, is nearly about eight feet more in some places; and an additional length of 15 feet, to give the ends of the piles a proper hold in the bottom of the river, would make the length of these piles, 47 feet in all. The greatest size that can be found for piles is 14 inches square; so that the strength of these piles, 47 feet long and 14 inches thick, is the most preposterous thing ever proposed, even although there should be a double row, with what he pleases to put between, to support a body of water 24 feet deep, in continual motion against the sides of this inclosure; and having the weight of eight feet of filth all round on the outside of it. There are many considerations, that attend the putting such a thing into execution, which would be trifling to mention here. If he had made any observations, upon what happened at one of the abutements at Westminster-bridge, and in a work in the Green-Park, he surely would not have thought it eligible to be put in execution. The cen-

*greatest
low water
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ter which he has drawn in the great arch, is without doubt a composition which employs double the quantity of wood necessary. To describe it would be endless, you will be the best judges how far it deviates, from even the common inventions of a country carpenter, but much more so from any ingenious contrivance of a mechanick. The center which he caused to be put in execution at London-bridge, was of this same sort; so that it could be wished, for the good of the publick, that he would at least keep pace with his cotemporaries; and copy, if he cannot invent, what is done by them. What a vast difference there is betwixt this center and that one made use of at Westminster-bridge. The method he proposes of making hollow cylinders in the spandrels of the arches, will not I believe save so much money, which is all he proposes by it, as he imagines. The space which he has placed the cylinders in, is commonly occupied by gravel, so that the expence of turning the arches, so as to form these cylinders, would be much more than the expence of that quantity of gravel laid there. The whole appearance of this bridge is neither grand nor striking. Nor has it
any

any thing, so superlatively ingenious, to recommend it so much, as to make us put up with the disadvantages I have mentioned above.

Mr. G W Y N.

This design at first sight strikes me something like looking at a Turkey-carpet; where one is pleased with the whole, because of its variety of colours; but when our attention is taken up with any single part, we are dissatisfied, and wonder how any one could throw away so much labour in making these parts, which have no resemblance, or connection with what one might expect there. This gentleman when he sat down to invent, had some ideas of producing a thing striking and magnificent, but the manner in which he has done it, renders it a trifling gewgaw. Although there may be a difference in taste, yet I find that every body agrees when the magnificent is procured by the simple and the genuine, it pleases universally all ages and nations. Witness the Ægyptian, the Greek, the Roman buildings. Witness, for example, Covent-Garden church. Is there any thing tawdry there? Are any pastry cook orna-
ments

ments hung on it, to deck it out, which fashion in half a century might find fault with? No; that rigid virtue and severity will convey the sublime idea to all ages, when fashion will condemn, and time will have mutilated every thing that looks like candy'd sugar. This is treating it in a poetical sense; but this otherwise ingenious gentleman, might have known if he had received a regular education (for he was till of late of another profession) that there is a certain circuit of forms in architecture, produced by the materials of which it is composed, from which a man should never deviate. If he had considered the connexion and almost sameness of forms, produced by the Druids, the Mexicans, the Ægyptians, the Greeks, the Etruscans, he would never have deviated so far from stone and lime, as to borrow a form from the foot of a drinking-glass, or front of an organ. Yet this is his taste, and of that species, which commonly last from one birth-day to another.----The drawing part is very well executed, and for that purpose, I have been told, he had the helping hand of Mr. Wale, who goes partner with him in this venture. There is placed upon the

two

two middle piers a group of small columns like organ pipes, to support either a recess or a clock. The form is taken from those of Westminster-bridge, which look more like a centry-box, than any form produced by the squareness of stone. There are no more columns till you come to the piers next the shore, and these intermediate ones are covered by a thing like twisted glass, which supports, what are things of vast importance to the benefit of mankind, a globe or a pine-apple! The groups of columns next the land, being shorter than the middle ones by the fall of the bridge, and no intermediate gradation between, look like dwarfs of columns or over-grown banisters. By shewing the joints of the arch-stones which tend towards the center of the arch, and not the cross ones which make the length of the stones also, the arch looks as if it was composed of deal boards, or beams lying side by side. In short, the whole of the ornaments are of a piece with these examples, in illustration of which, I shall lose no more time.

The height 28 feet of the great arch from high water, and the width 84, might have been a little more, for the easy passage
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of the tide and barges, without giving any inconvenience otherways. The height of the arches next the land is so much, that the forced earth is 21 feet, which upon consideration of what has been said on that head in Mr. Dance's plan, will be found to be a great deal more than necessary, as no advantages accrue from it. ---- All the arches are semi-circular, and the piers in such proportion to them, as would render it strong.

Mr. M Y L N E.

The composition of this design to the eye without enquiring into the mechanism of it, is magnificent, yet simple; light, yet not too slender; and modest, without bordering on rusticity. His idea of making it a repository of the actions of our admirals, since England began first its present dominion of the sea, is certainly a noble and elevated thought. He does it in the most simple and yet sublime way. After reading the greatest and most heroick actions in plain and modest inscriptions, one naturally wishes to see a likeness and the features of the person who did them; for that reason their statues are placed just below, skreened
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from the weather, and must be viewed from an element whereon these heroes have raised the character of this nation above all others, and far above any one of antiquity. Every Englishman must wish to see put in execution, a thought which has no relation to mode and fashion, no appendages but such as are genuine, and will stand the test of ages. The particular parts of this design are all dictated by utility, and becoming ornaments render it very much in the simple and genuine taste of Covent-Garden church. The cornice along the bridge is grand and striking, and answers wonderfully well on the top of the columns likewise. The iron railing is trifling and not at all of a piece with the bridge, although I understand the author's manner of arguing gives it a species of plausibility. The recesses, which are very necessary in such a long bridge, have not their coverings projected enough. The method of making the recess to serve also as a monument to the river, is easy and gives it for that reason a more useful form within, and what is proper to stone without. The method of supporting these recesses by two columns from the ends of the piers is very simple, and gives a great ornament to

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the whole length of the bridge. But there is along with it this objection suggested by some people, that bargemen may fasten their cables to their feet, and so in time loosen them. The same may be said of the rings at the ends of the piers, which to be sure would convey an idea of the Thames being a navigable river for ships of great burden; but when there is genius and attention to greater things, the lesser will often be treated with inaccuracy or negligence.

The height of the great arch is 28 feet above high water, and such as would make it very convenient for the large craft. The height of the arches next the shore, is high enough for any wherries and boats, and yet the forced earth is no more than 12 feet and an half. The surface of the bridge makes from one end to the other a segment of a circle, which gives it a light form, taking it in a profile view, and will produce a pleasing variety in passing over it: At the same time that it renders the forced earth on the banks much less than if it had been two strait lines. The width of the arches is so much in proportion to their height, that they become elliptical. This to be sure would be very convenient
for

for the navigation, if it is strong enough. Every body agrees that a semi-circle is stronger than any other figure. But a semi-circle to the same width would make a most inconvenient bridge and a semi-circle to the same height would not be so convenient for the navigation. This great arch differs in height nine feet in 50 from a semi-circle, so that it preserves the conveniency of the navigation, without making it inconvenient for the passage along the bridge. To render it strong enough, he has calculated it so, that the arches makes no lateral pressure on the piers, but the weakness is, that the middle part of the arch makes a lateral pressure against the haunches of it. These haunches of the arch he has secured in such a manner by rubble work, a counter arch, and an horizontal course of stones, that the spaces between the feet of the great arches are filled up for 35 feet high from the top of the pier, so that, if I understand it right, all from the haunches of the arch downwards becomes a pier or abutment, to support a small part of the arch in the middle as a segment of a circle. This middle part, if built like other arches would make a lateral pressure against these

abutments, but to take that away he has placed cubical stones, which he calls joggles, in the joints of the arch; so that every stone tends to fall perpendicularly by its being carried along with the one above it, and not shoved aside as in other arches, which is the cause of lateral pressure. For these reasons I should imagine that this bridge would be, with the extraordinary thickness of the arches seven feet, a vast deal more than what is called sufficiently strong. The great arch at London-bridge is three feet and a half thick, and thought strong enough for all the heavy carriages that are to pass over it; the thickness of the piers is such as will resist the lateral pressure, which it makes by being a segment of a circle. Now if the middle part of the great arch in this design is seven feet thick, therefore double that of London-bridge, with the addition of the joggles, and supported as well by what I call pier from the haunches downwards, I should conclude that it was much stronger than it, and has far more strength than can ever be required. The thickness of the piers is a 1-5th part at the top, and a 1-4th part at the bottom of the opening of the arch;

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so that supposing any arch standing independent by itself, I think, it would be just as strong, as a semi-circle standing on the same piers without all this work in the haunches and joints of the arch. I don't mean to maintain that this will hold good in every elliptical arch, but only in one which differs so little from a semi-circle. Whatever may be the result of your own judgment in this respect, yet I think, it is a very great proof of the author's attention in the nice calculation between strength and conveniency. There is a certain strength in Westminster-bridge, but it is a lubberly strength; for the same quantity of materials might have been disposed in such a manner as would have rendered it much stronger and much more convenient. Allow me to give one instance; might not a little have been taken from the thickness of the piers at top, and added to the thickness at bottom; by this means a wider passage would have been gained for water and shipping; the pier would have been less apt to sink by its broader basis, and the weight of the spandrels would have been less upon the bottom of the river. All the methods which he proposes for the construction of this bridge

bridge are ingenious, and shew a good mechanical head. That they are easy and simple, you will be more able to judge, from his own demonstration. But I beg leave to name a few, wherein he goes beyond those made use of at Westminster-bridge. The method of building the caissons within high water-mark, and yet above it, upon frames that fall to a level, where the sides may be floated and fixed to them. The method of making the sides of the caisson higher than high water-mark, and splitting them in the middle to be carried away, after they have preserved the pier dry from the laying the first course of stones, till it is as high as high water-mark. The method of supporting the centers from offsets in the sides of the piers; and by that, saving the piles, and trying the piers. The improvement made on the center itself, and manner of joining and lowering it. The method of constructing all the arches by three centers only, which is so simple, that one is surprized it has not been found out before now. The method of founding the abutments in cases made of the old centers and sides of the caissons. The method of joining the courses of stone in the piers, is a great improvement

ment on that of the ingenious Mr. Smeaton's invention for Eddifston light-house. All these, which I have been able to remember, are so palpable, that one is surprized and pleased at the same time. The author I hope will pardon me if I have forgot or misrepresented any of them. The form which he gives to the ends of the piers, as the best for cutting the water, is I think without doubt, better than any other hitherto made use of. It is made nearly like the bow of a boat, and yet so, as is consistent enough to be put in execution in stone. By which means it is something like Sir Isaac Newton's irresistible solid. The form of the abutments are such as will give a greater resistance against the bridge than in the common way; for the pressure of the bridge against the land will be thrown every way like the radii of a circle from a center.---The stairs down to the river are contrived so, as to leave no space between them and the bridge. And the entrance, like the mouth of a trumpet, is certainly the best form; as passengers are supposed to be collecting from all quarters in their approach, and dispersing when they have past over it. The manner he proposes to lay
out

out the streets adjoining to the bridge, would conduce greatly to the magnificence of this city; but as that is no part of the present enquiry, we shall not take it into consideration. This whole design I should imagine was a nice calculation betwixt strength and conveniency. And the outside of it, made grand and magnificent by the particular parts, which rigid utility only has placed there.

Mr. P H I L L I P S.

This gentleman presented you at first with 11 plans, of which there are three remaining under consideration. If he has made each of these a particular study, I should imagine he never sought for data to invent them from. To build this bridge is one thing, and to do it well, there is certainly a point of perfection, if it could be arrived at. If any one of these 11 comes nearer to this point than the rest, all the remaining ones are useless. From this I should conclude, supposing I had never seen them, that no great trouble was taken about the invention of them; but that lines were drawn and compasses twirled round without

without an attention to numbers and quantity; since they were all offered as equally good. From seeing them, I am still more convinced in that opinion; by finding that the difference between these three plans, is only a modulation of useless and ill-placed ornaments, and not the different calculations of the powers of mechanism, from its being supposedly built of different materials, or different disposition of these materials. However this gentleman, I suppose, will be pretty easy within himself, in being conscious that they were not drawn by himself but by another. As to the merit of the design, I refer you to what is said on Mr. Bernard's plan; from which it may be concluded, that although a carpenter can convert himself by the help of a Palladio Londinensis lying on his bench, into an architect; yet a certain quantity of stone and lime cannot be so easily converted by the same recipe of magick, into the best form for a bridge across the Thames at Black-friars. The height and width 82 feet for the great arch is pretty well, but rather too little, for what is required of it. The height of the ends of the bridge is

F such,

such, that 22 feet of forced earth is supposed to be laid upon the present banks ; for the utility and necessity of which I refer you to what is said on Mr. Dance's plan in that respect. The stairs are not included as a part of the estimate, though they are by most of the other gentlemen. He proposes to pile the whole river from bank to bank, for the doing of which I don't find that he or any body has sufficient data, to say it is absolutely necessary, nor can I say it is not necessary. All we know is, that it is a gravel. But whatever sort of a gravel it may be, although piles below the piers may be of service, or even absolutely necessary in some gravels, yet to pile it from shore to shore, I should think would make it like a quagmire. When it was asked him by one of you, gentlemen, how much wood he proposed to make use of, in a center for the great arch of his design, he answered 2000 feet. If he proposed this as a sufficient quantity for the whole center, it agrees very well with his not starting to put in execution a design of the center for the new arch at London-bridge, which although a less arch than this, contained

tained 17,000 feet of wood. And if he proposed it only as one of the ribs of a center, the whole would be of a piece with the absurd invention of that center. In the middle of one of the designs, there is placed a building, which I should imagine, from its form, was an antique temple or modern summer-house, and for that reason could not admit that passage through it, which goes along the bridge; but if it should even do that, and be put in execution, contrary to the act of parliament, I would advise that its name should be wrote upon it, that people may not mistake what it is, as probably I have done. The first painters of antiquity were wise enough, in their lame representations of nature, to write under their works, this is a *cow*, or this is a *horse*.

Although the toll, which is to be laid upon this bridge, will only be a temporary thing, yet here are toll-houses built, and situations made for them in one of the designs, as if it was to be a thing of the same age with the bridge. It would be trifling to say any more of the other parts of these three designs, they being so much of an ill understood composition, where the most is copied and misapplied, that I will

not detain you any longer on this gentleman's productions,

Mr. S M E A T O N.

This design, I should have expected, from the author's reputation in mechanics, and what was said by those who are most acquainted with his merit, would have been a most compleat piece of mechanism. This however, I don't find quite so clear, but on the contrary, it is from ocular demonstration, the weakest of all the designs given in. Whether it is strong enough, we shall see presently. Whatever composition of a bridge, is adapted to be put in execution, it must have this quality; that one of the arches with the piers on which it rests, might stand in the middle of the river, all alone, independent of the adjoining ones, in case through any accident or design they should fall or be taken away. That these accidents may happen, we know very well from Westminster-bridge; therefore to avoid the disagreeable circumstance of seeing the whole bridge fall, if any particular part should give way, all these parts should be made so as to stand of themselves. The width of Mr. Smeaton's
great

great arch is 110 feet, and its height is 37 from where it springs: So that it differs 18 feet in 55, or nearly 1-3d from a semi-circle. The curve is an elipsis. But supposing it any curve, such as a segment of a circle, or a catenarian one, this proportion of the height of an arch to its width, will cause a very great lateral pressure against the piers; which piers should be made strong enough in themselves to resist this lateral pressure; because we suppose the adjoining arch gone by accident, therefore can have no help from it. It is necessary for the navigation of this river, that the piers of a bridge should be thin. When they are thin, they are apt to be overturned by the lateral pressure of a great arch, although they might resist that of a small one. Mr. Smeaton's two middle piers are 15 feet thick at top, and the same at bottom, very well considered I must own for the passage of water through them. But how they will support the whole weight of an arch 110 feet wide and 37 high, and resist at the same time the lateral pressure caused by the flatness of the arch, I cannot conceive. Even when arches are semi-circles, which every one agrees makes least lateral pressure on the piers, authors say, that the
 thic.

thickness of a pier should be at the very least,
one sixth of the width of the arch ; and in
that case, supposing a better bottom, than
the river Thames has. Yet these of Mr.
 Smeaton's are less than one seventh of the
 opening of the arch, and are to support an
extreme heavy arch, which presses on their
sides and not on their tops. The only re-
 medy is to support it by another arch,
which indeed is Mr. Smeaton's manner of
arguing ; for he supposes that the arches
are all to be built at once, and that the
abutments being made good, they will stand
upon these sufficiently thick piers. But if
 he would only reflect, that in his design,
 there is not that supposed strength in the
 abutments, and even if there was, by their
 becoming one half foot more distant, the
ruin of the whole bridge ensues. But to
 cut the matter short, if we suppose an arch
 to be taken away, which he has never
thought of, and yet is no improbable
 thing, all the others must follow one ano-
 ther, like a game at nine-pins, or a house
built of cards. For these reasons, I should
imagine, that the proportion of the arch is
 bad in itself, and still worse when joined
 to such piers. But how much is this idea
 of

of weakness encreased when we are told,
that the thickness of this so extensive arch,
is only three and a half feet in the middle.

This is deviating from experience and the
opinion of all ages, and proves what an
absurd piece of mechanism this composition
is. As a piece of architecture, every per-
 son who has seen it agrees, that it is the
meanest and poorest of all the designs lying
before you. He says himself that he knows
nothing of this art. And the whole of the
 design is indeed a proof of it. But I should
be glad to let him know, that a know-
 ledge of architecture is not only an exact
calculation of the great forms in buildings,
 but likewise the bringing forward some of
 the materials which compose the great
 mass, and giving them such forms, as
 will serve some particular useful purposes.
 If he had known this, he had never made
 this design like a garden wall, nor placed
 upon it a railing of iron like those of pri-
 vate houses, or that of Lincoln's-Inn-fields.
 He has borrowed so much from architec-
 ture though, as to put a *Torus* along the
 bridge for its cornice, which is the very
 worst form he could have found, for throw-
 ing the rain-water off the sides of the
 bridge,

bridge, if he had turned over Palladio from the beginning to the end. The plan of the recesses is very bad, and the two in the middle which are covered by a thing like a centry-box, have got a scoop taken out of the broadside of them; and are scratched on the top, to give them the appearance of thatch, I suppose. The form of the stairs and all about the ends of the bridge, is not only aukward, but mean. The quantity of forced earth on the banks is so very small, that to this convenience and the easiness of passing along the bridge, he has sacrificed the passage under it, and not struck the just medium betwixt the one and the other. At high-water even the great arch would have its haunches quite sunk under it, and that part of the arch, which would be above, makes such an angle with the horizon, that no boats nor barges could pass any where but directly in the middle.

An arch of 70 feet width, if of the same width, could afford as great a conveniency in this particular. What a horrible appearance such an arch would then make, and how like the idea of its sinking by an earthquake throw the bottom of the river. He has artfully avoided drawing highwater-
mark

mark upon his design, that any one who looks at it, may have only the most favourable idea, which if it was put in execution, would happen only for an hour every fortnight.

He proposes to build the piers within an inclosure or batterdeau, for my sentiments on which you'll be so good to turn over to what is said in that respect on Mr. Dance's plan. Upon the whole, supposing it to be even a better design than it is, in many respects, I should conclude that instead, as he promised, of its positively being the best chain of arches of any bridge in the world, it is the worst string of them, when compared with the other ten designs, or any thing hitherto done.

Mr. W A R E.

This design, in regard to convenience and utility, is partly good and partly bad. The middle arch is a semicircle of 100 feet wide, and springs from one foot below low water-mark. This width is very good for water way, and more so for navigation. The height is 33 feet from high water, something more than is necessary for the

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navi-

navigation, and would make the ascent of the bridge a great deal too steep, if it came from a reasonable height of forced earth on the shore. But, however, to avoid that inconvenience he has been obliged to suppose 23 feet of forced earth laid on the present banks, part of the same error mentioned in Mr. Dance's plan. It is a lamentable thing, to see men of genius lose the reward of their labours, for not having attended to some particular, with the same degree of accuracy, as to others : And they, esteemed otherwise superior to their cotemporaries, step out of life, quite dissatisfied, and thinking the world has not done justice to their merit. But this, I am sorry to say, is not even the case with those, who in the present case have committed errors in the composition of their designs. They seem rather to be the effects of jumbled ideas, and want of method in the first thoughts at sitting down to invent this bridge. Had they investigated fairly the first requisites of this proposition, and made their inventions answer accordingly, small inaccuracies might be overlooked ; but when these inaccuracies are the

the very essential parts of this bridge, it is impossible to prefer them, without entailing on posterity, a thing inconvenient for them, and dishonourable for us. Mr. Ware's design, although not the worst of those in competition, yet will be found erroneous from what is said above.

In the ornaments of this design there is nothing very absurd or contrary to the common practice of enriching buildings. But they are of that species, which although one does not wish them away, there is no necessity for their being there. They may all be shaved off without doing a prejudice to the construction of the work ; which shews how little utility is consulted in most of the compositions of this age.

C O N C L U S I O N.

I am very sensible, gentlemen, there are many other particulars, which through want of place here, and very probably my want of capacity, have not been suggested ; But these, I should imagine, are the greater number, and of the greatest consequence. From whence it may be concluded, that, besides the particular faults mentioned in

the discussions of each of the designs, the plans of Messrs. Bernard, Dance, Gwyn, Phillips, and Ware, cannot be put in execution, for the great quantity of forced earth, supposed by each of them, more or less, to be laid as necessary on the present banks of the river. That Mr. Chambers's cannot be put into execution, for the narrowness and lowness of its arches. And that Mr. Smeaton's cannot be put in execution, for the lowness, and weakness of the arches, when joined to such piers. There remains only Mr. Mylne's; which will be found, by comparing it to the standard mentioned in the beginning of this letter, to afford a very easy passage across the river for men and carriages, with little forced earth on the banks of the river; and at the same time affords as easy a passage for water, boats, and barges under it. By this, it appears, that he only has struck the just medium between the two opposites of passing over and under this bridge. It is doubted however by some people, whether the method he has taken to support this imaginary line, by the proportion of his arches and piers, is strong enough. If I differ

differ in opinion from them, I have endeavoured to assign reasons for it, in what I said on his plan. But likewise it appears, from comparing it with the opinions of the other competitors, that even they think such an arch strong enough for all the purposes required, supposing the methods which he has ingeniously contrived to render it strong, were even left out. Allow me to compare the dimensions of his great arch and piers, with those of Mr. Smeaton, whom I take to be a much better mechanick, than any of the other gentlemen,

	Smeaton's.	Mylne's.
Width of the arch ———	110	100
Height of the arch ———	37	41
Thickness of the piers at top	15	20
Thickness of the piers at bottom	15	26
Thickness of the work at the middle of the arch ———	3½	6

The first is what Mr. Smeaton thinks sufficiently strong; the second is what Mr. Mylne thinks sufficiently strong. Therefore Mr. Smeaton thinks Mr. Mylne's is as much stronger than his own, as there is difference in these dimensions; which is not a little. This only regards the quantity and disposition of the materials; but when

when we are told that Mr. Mylne proposes to put joggles in the joints of the arch stones, which every body agrees is a great addition to the strength of an arch, we must conclude, that Mr. Mylne's plan surpasses greatly Mr. Smeaton's in point of strength. The other gentlemen who have proposed semicircular arches have allowed only, some four feet, some more, but none seven feet at a medium for the thickness of their arches. So that this arch which differs so little from a semicircle of seven feet thick will be stronger than a semicircle of four or even five feet thickness. But likewise, as I said before, if this work has methods in its construction over and above what is supposed in the others ; then these gentlemen from their own principles must agree that it is superior in point of strength.

Allow me then, gentlemen, to conclude, that Mr. Mylne's is superior for utility, strength, elegance, magnificence, and ingenuity in its manner of construction, to any of the other ten plans, which lye before you.

But still, if you should be of opinion, that although all the other parts of Mr.
Mylne's

Mylne's plan deserves approbation, yet you are not sufficiently warranted, to put the proportion of his arches into execution : This may be done. Let the width of the arches and thickness of the piers continue as they are. The arches at present spring from three feet above low water-mark, and differ nine feet from a semicircle. Let the curve of the arches be a semicircle, and spring from three feet below low water-mark. Let every other part of the design continue as it is, with the addition of the stone balustrade, which he offers you. And then the alteration will make this difference only on the present design, that the arches are semicircles, the columns are three feet longer, and the forced earth on the present banks will be three feet more, which added to the already supposed 12 1-half feet, will make it 15 1-half feet. I would propose at the same time, that the methods, which he has invented to render his arch as strong as the semicircle, should be applied to this semicircular bridge, and by that means make this design in point of strength, infinitely superior to any of the
other

other schemes, and to any bridge hitherto ever built. For although we know from experience, that a semicircle built of an equal thickness all round, as is commonly done, is sufficiently strong. Yet any one, who is acquainted with mechanicks, knows that the stones of such an arch are not in equilibrium, but might be rendered so, by the different thickness of the work which will form the extrados, while the intrados is a semicircle. An arch may be made of an equal thickness all round, and every stone of it in equilibrium, if the strength of the piers on which it stands, and the weight which it always carries, is considered at the same time. What that arch or curve is, would be foreign to the present purpose. It is sufficient to know from thence, that if it is necessary to make the length of the arch stones of the semicircle different, to put them in equilibrium; the same remedy may be applied to an ellipsis, if it differs but a little from a semicircle. Such refinement is not necessary here. The superiority may be assigned to Mr. Mylne's arch, with only an ocular demon-

monstration. But however in making the above-mentioned alteration, it appears, that nothing is borrowed from any of the other plans, but the arch from the ingenious Mr. Bernard's, to whom an acknowledgment worthy of your dignity would be sufficient for this particular.

This alteration is only proposed if the semicircular strength should be so riveted to your breast, that you will not depart from it. For I beg leave still to be of the opinion, that the other is more elegant and convenient, and is not only sufficiently strong, but surpasses in that respect all the other designs. Yet if any man differs from me in opinion, he will be so good, before he determines, to have recourse to the facts in the designs, and the nature of the river Thames. And if these, which I have endeavoured to collect, should be found genuine, a difference should still subsist upon summing up the whole ; let him lay his hand on his breast and weigh them over again. And if at the same time some worthy and endearing friendship should have got some small possession there ; let him, as I have
H done,

done, wrench it for a moment out, and,
like Brutus, endeavour to do a service to
our country, and fellow citizens.

PUBLICUS.

F I N I S.



POSTSCRIPT.

MR. Smeaton having been intreated by his friends (a species of beings very fond of entering into argument, without knowing the difficulty of supporting it well) not that he had any good will of his own, has endeavoured to answer some objections made to his plan, which was obliged to be taken notice of in the cursory discussion of the whole number. I thought it proper to set what he calls misrepresentations in such a light, that you gentlemen may be better able to judge, than from his partial account of them; lamenting at the same time the triflingness of the subject, and the weakness of his arguments.

I say that, in the first place, he has delivered in a design weaker than all the rest. Because, it is supposed that the principal strength of a bridge consists in its foundation, that this being well secured, the superstructure, *if built upon just principles*, seldom fails. It has been supposed in my discussion of the plans, that every one has made good the foundation for the weight of his own Bridge, as well as Mr. Smeaton has supposed for his. So that Mr. Smeaton cannot compare the probability of the sinking of his bridge, with the probability of the others, unless he compares at the same time, the strength of their foundation with the strength of his. He has supposed a certain strength to be made good for the foundation of his bridge, which will just carry it, and that is all, and then to try the others, he sets their bridges upon it, without asking their leave; (this is candor I must own!) therefore it is not, which bridge will

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degree of strength
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nature.*

*he has so
his foundation
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sink easiest, but, when the foundation is sup-
 posed to be made good and rendered immove-
 able to each, it is, which of the piers can be
 easiest overturned, by the lateral pressure of
 each of their arches. Now as Mr. Smeaton's
 piers are 15 feet at top, and being 25, for two or
three courses of stones at bottom only, they are
 15 likewise at bottom in reality. For if he in
 justice could count upon 25 feet at bottom, his
 piers should have been of a pyramidal form,
which is not the case ; but on the contrary are
 15 feet thick from the top towards the bottom,
 till they meet two or three courses of stones of
 25 feet broad, which he might have supposed, as
 well of 100 feet as to the easiness of the piers
 being overturned. For the pier will break at
 its smallest basis, and not take that shoe along
 with it, in overturning. Now I say, as Mr.
 Smeaton's piers are such, and the width of the
 arch 110 feet, therefore the smallest in propor-
tion to the incumbent weight ; the strength of
 his bridge, as to the overturning of the piers,
 will be the weakest of all the rest. With respect
 to his arches, allowing that all the arch stones
 are in equilibrio, with the middle one $3\frac{1}{2}$ feet
 depth, he had good reason to make them so
 thin ; for he knew very well if he had made
them thicker, according to his own investigation,
they could not be supported by the piers. This
 he tacitly confesses when he says that the arch
 will only bear a few 100 tons. But according
 to my investigation they could not be supported
at all : For such a segment of a circle of 108
 degrees, whose radius is 64 feet, like an obtuse
 wedge, can very easily separate two piers of 15
 feet thickness, and 20 feet height, counting
 from the end of the middle curve downwards,
 even although they stand upon a platform of 25
 feet

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feet breadth; as they have no other strength but their own gravity to keep them in their places. This too he seems to confess, when he says, that to build one arch, it must have not only its own piers to stand upon, but likewise the help of the adjoining ones, which are built up for that purpose, and struts put from the top of the one to the top of the other. If then he is so frightened to build one arch upon its piers alone, how will two piers support this arch, when the adjacent ones should fall? Or which is more to the purpose, how will one arch be supported by one of these piers, when only one arch along side of it falls, and it has the pressure of all the others on the other side?

Secondly, This curve is elliptical; that is to say, it is, what all the world means, when speaking of arches, half of such an ellipsis as is always put in execution in arches, because the mathematical ellipsis cannot be put in execution, but with a great deal of trouble. Workmen, and after them all the world, except a few pedants and quiblers, call it an ellipsis, because it is liker that, than any other figure. But to get out of this scrape, he supposes that the two lower curves, for the whole arch is composed of three, have the joints of their stones horizontal, and therefore may be called pier. But this is neither taking away the profile of the work, which when built, every one would take to be an arch, because it is curved; nor is it any recommendation of strength to it, since all the corners of the stones will flush off by the pressure of the middle curve 102 feet width upon it; because the ends of the stones will not be cut at right but acute angles with their beds. Therefore I would advise him, for its strength, that the joints of the outside stones at least, should be at right angles

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with the profile of the work; and then, if he calls it pier, he might suppose the whole bridge composed of no arches, but of piers only, if the spandrels were filled up with stone to the level of the road. I should be glad to know what sort of a curve Temple-Bar is, which is solid not only in the haunches, but likewise a great way above the top of the arch. Here I must observe that this his last design, which he has now given in before you, the committee, has arches so far different, from the first made in the year 1754, that the radius of the middle curve is two feet longer; that the arch has got two smaller curves, it had not before; that the arch is two feet wider, and $3\frac{1}{2}$ feet higher from low water-mark; and has its piers one foot thicker.

*in their present
time Mr. Smeaton
by his own*

*I never saw
difficult to
than the
the broader*

Thirdly, I have supposed, that Mr. Smeaton proposed his arches to be built all at once, because I think it can never enter into any man's head to do otherwise with such proportion of arches to piers. Surely it is the only probable scheme of getting such a bridge upon its feet; for he could never learn from observation and experience, even although it is arrived to the utmost of his wishes (humble enough I must own, if this composition of a bridge is their *summum bonum*) that such a hazardous proportion for a bridge could be ever put in execution; but in a narrow river, that had strong abutments, and could be spanned with three arches. He may produce (I know he can) some examples of such thickness of an arch, such flatness of arches, and such smallness of piers; but never in one bridge over such a river as the Thames.

Fourthly, That as a piece of architecture it is mean and poor; because from what is produced, it is plain, his sagacity could not suggest the ornaments

nament that naturally arose out of the subject. Simplicity in a thing which exactly fits what it was intended for, certainly will always please, not only in the great mass, but likewise in the minute parts which compose that mass: But when deformity both in the great mass and its particular parts is exposed to our view, it can never, I apprehend, give any idea but what is contrary to pleasure, although it should be stripped of every ornament, and even those that arise from the minute parts being fitly applied to some useful purpose.

*Mr. Ince
design
infinitesimal
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of manner*

Fifthly, That he does not know any thing of architecture, when he says he knows aqua-tick buildings, or buildings under water. For although the piers of a bridge may come under the cognizance of one who builds mill-dams; yet I should imagine, that the superstructure of such a bridge as this should be, and in such an opulent city as London, whose equal never was in this world, requires a knowledge of every part of the extensive study of architecture, and a genius fit to receive impressions, noble, sublime, and magnificent, that our posterity may not blush at our want of capacity and groveling ideas, as we do now for those who built London-bridge.

Sixthly, That to the convenience of passing over the bridge, he has sacrificed the passage under it. For altho' his land arches are very well, and within the limits, which he approves of; yet the great arch, by being 40 feet high from low water mark, therefore 24 from high water mark, is a great deal too low for what is required of it, being two feet lower than Westminster-Bridge, three feet lower than the smallest in my standard, and two feet lower than he has represented it himself.

*Westminster
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The smallest in his Standard is 26 feet*

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tion of
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Seventhly, That at high-water, his great arch would make such an angle with the horizon, that barges and large crafts could not pass any where but in the middle, insomuch, that an arch of 70 feet width would afford as great a conveniency in this particular. For the use of a great arch, is not for boats who have their sides as low as a cockle-shell; it is for large barges, who have their masts lowered, and lying on their high poops; in that case the latter arch would be almost as good as the former, without giving the disagreeable idea of our passing through an arch quite choaked up.

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Eighthly, That he has omitted drawing high-water mark upon his design, that those who look at it, may have only that favourable idea of it, which will only happen once a fortnight; not that it would be a very favourable idea either to see so much of the nakedness of a small pier, supporting such immense arches. For, from a point at the end of an arch, no man can know what effect that arch will have, unless the chord is drawn. Yet that point I cannot find out on his drawing, for the ends of the piers goes all the way up to the surface of the bridge, varying their form, as if they were cut out of chalk, to support places, which, as they are all uncovered, but the middle ones, will receive the watry tribute of every passenger.

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Ninthly, That he has proposed to build his piers in an impracticable method, when he proposes to build them upon a dry bottom. For allowing him to make his inclosure strong enough to resist the water on its outside, (which I doubt much of) yet the bottom of the river, being a gravel, cannot resist the weight of water on it; but, by the openness of its texture, will allow the water to boil up in the middle of
the

the inclosure. When ballast is dug out of the river Thames, the barges never shift their place, for the gravel comes boiling up in the same place always, as they take it away; how much more so would water come, if such a weight of it as 30 feet was pressing on the outside of the inclosure?

Lastly, I must conclude, that as there are no misrepresentations of either Mr. Mylne's or Mr. Smeaton's plans; because when I called the former's arch seven feet thick, I meant at a medium; that as the radius of Mr. Smeaton's middle curve is 64 feet, and Mr. Mylne 56; that as the radius of Mr. Smeaton's small curves is 18 feet, and Mr. Mylne's 35; that as the thickness of the arch is $2\frac{1}{2}$ feet in favour of Mr. Mylne, tho' his curve is not so flat; that the stones being in equilibrio in each arch, with the middle part; that the spandrels in either of the designs as high as the lesser segments being solid, Mr. Mylne's piers have less extension of curve to support in proportion to the whole width of the arch than Mr. Smeaton's; that as Mr. Smeaton's piers may be broke off at a good distance below low-water, at 15 feet thickness; Mr. Mylne's at no where but at the 26 feet breadth, because they keep gradually encreasing from 20 feet at the top to the bottom. I must conclude, I say, that by these dispositions of the materials, Mr. Mylne's arch is much better supported by his piers, than Mr. Smeaton's arch is by its piers, and if the whole composition is more massy, it will resist much better any given weight. And if any suspects what I say in respect of its elegance and beauty, let them go and look at both. For every one, who has seen them, agrees that so far from being equal to Mr. Mylne's it is the worst there.

And now, if I could allow myself, to be so far out of humour, as he, to speak so immodestly of himself, of his

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his observations, of his experience, of his being *the proper person*, that he is no Tyro or young schemer, I would put my name to this account of all the plans, thinking in his way, that there can be no better; but as I am persuaded there may be much better ones, I would advise him to think there may be a much better bridge than his composition. And so far was my intention in writing this from raising Mr. Mylne's knowledge in bridge-building, on such a weak structure as his, that I think he should have been the very last of the candidates to have mentioned such a thing; and not so arrogantly asserted that he only was the fittest ladder, by which Mr. Mylne should climb to the temple of Fame. Who I am, it matters not for the public weal; it is sufficient to know, that uninfluenced and uninterested, but for the public good, and therefore for superior merit, I sat down to put a few thoughts together upon this subject, at the same time that I profess my opinion may be fallable, and some facts might be misrepresented, which if there should be any, I most humbly beg pardon, as the only motive for writing at all was to serve my fellow citizens, and you our trustees. And so far from partiality for or against any man, being the motive of what I have wrote, that I declare, but a few months ago I thought Mr. Smeaton from his merit in other works, was the fittest person to build his bridge; but he will pardon me, if I think otherwise now, and allow my eyes and reason to be judges of what lies before me. If he thinks however that he is ill treated, he should blame himself for producing the cause, and he may be assured, that altho' it gives me pain to find fault with an individual, yet he, as an atom among the million of this city, must be set aside when the good of the whole depends upon it. Here I must observe, before I have done, that besides the petulance with which he puts an alternative to a man whose fault, it seems, is being his competitor, whose merit has received the highest stamp among foreigners, and blazed forth in so short a residence here, I cannot but admire the earnestness with which he wants to know the identity of the person who dares to find fault with his design. But if he thinks this would be of any mighty service to the public, or satisfaction to himself in particular, let him take the first man he meets in the street, and shew him his drawing.

F I N I S.

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